Claims

1. A method for modulating radiation exposure of a multi-layer resist, comprising:

predefining a desired pattern of exposed and unexposed regions in different layers of a multi-layer resist;

patterning the multilayer resist by repeated depositing layers and exposing portions of each layer to radiation; and

varying the size of a radiation beam over a particular layer of the multi-layer resist.

2. The method of claim 1 wherein the interior of a layer is patterned at a larger spot size relative to perimeter portions of the region which are patterned with smaller sized spots of radiation.

3. The method claim 1, wherein the modulated laser beam spot size is applied to a positive resist.

4. The method of claim 1, wherein the largest spot size is determined by calculating the functional dependency of exposure dose in proportion to laser power and intensity distribution, scanning velocity, and incremental line-spacing between laser scans.

5. The method of claim 1, wherein a sequence of different spot sizes are determined for patterning each discrete region on a layer.

6. A method for patterning a multilayer resist, comprising the steps of:

depositing a first layer of resist material onto a substrate;

scanning a beam of radiation to form a spot on the first layer and thereby expose a portion of the first layer of resist material;

depositing a second layer of resist material; and

scanning a beam of radiation to expose a portion of the second layer of resist material to radiation; and

varying the size of the spot of radiation delivered to at least one region of the second layer.

7. The method of claim 6 wherein the steps are repeated until a pattern having greater than two layers has been completed.

8. The method of claim 6 wherein the method further comprises treating the layers with a developing solution to remove the exposed portions of resist when resist is a positive resist or remove the unexposed portions of resist when the resist is a negative resist.

9. The method of claim 6, wherein the method further comprises heating the resist following at least one exposure step.

10. The method of claim 6, wherein the resist material is a positive resist.

11. The method of claim 6, wherein the resist material is a novolac resin.

12. A method of efficiently patterning portions of a photoresist preform, the preform having a perimeter, the method comprising:

calculating a maximum and a minimum spot size for radiant energy delivery, delivery essentially parallel a preform central axis;

depositing a first layer of resist onto a substrate; and

exposing first portions of the first layer to radiant energy,

wherein the spot size of radiant energy used to expose the first portions is increased proportional with an increase in a distance from the perimeter.